



**SYLLABUS of the MODULE (SUBJECT)**  
**General Information**

<b>Module title: Epigenetic in Medicine</b>	
Module type	Facultative
Faculty PMU	Faculty of Medicine and Dentistry
Major	Medicine
Level of study	long-cycle (S2J)
Mode of study	full-time studies
Year of studies, semester	Year III, semester I
ECTS credits (incl. semester breakdown)	1
Type/s of training	lectures (15 h)
Form of assessment*	<input checked="" type="checkbox"/> graded assessment: <input type="checkbox"/> descriptive <input checked="" type="checkbox"/> test <input type="checkbox"/> practical <input type="checkbox"/> oral  <input type="checkbox"/> non-graded assessment  <input type="checkbox"/> final examination <input type="checkbox"/> descriptive <input type="checkbox"/> test <input type="checkbox"/> practical <input type="checkbox"/> oral
Head of the Department/ Clinic, Unit	Dr hab. n. med. Tomasz Wojdacz, prof. PUM / Independent Clinical Epigenetic Laboratory
Tutor responsible for the module	Dr hab. n. med. Tomasz Wojdacz, prof. PUM tomasz.wojdacz@pum.edu.pl tel. (91) 441 72 01
Department's/ Clinic's/ Unit's website	<a href="https://www.pum.edu.pl/studia_iii_stopnia/informacje_z_jednostek/wfbmiml/samodzielna_pracownia_epigenetyki_klinicznej/">https://www.pum.edu.pl/studia_iii_stopnia/informacje_z_jednostek/wfbmiml/samodzielna_pracownia_epigenetyki_klinicznej/</a>
Language	English

\* replace ☐ into ☒ where applicable

### Detailed information

<b>Module objectives</b>		<ul style="list-style-type: none"> <li>• Introduction to the basics of epigenetics.</li> <li>• Epigenetic mechanisms - from epigenetic mechanisms in healthy cells to role of epimutations in disease pathology.</li> <li>• Clinical applications of epigenetic modifications.</li> <li>• The use of epigenetic biomarkers in pharmacotherapy.</li> <li>• Therapy targeting epigenetic modifications.</li> <li>• Current clinical research on compounds targeting epigenetic modifications.</li> <li>• Influence of environmental factors and nutrition on epigenetic mechanisms of gene expression regulation.</li> <li>• Role of epigenetic in aging.</li> <li>• Technologies and data analysis methods used in epigenetic research.</li> </ul>
Prerequisite /essential requirements	Knowledge	Understand the role of genetics and cell physiology.
	Skills	Be able to use knowledge of biology, medicine, and in the society.
	Competences	Self-education habits. Increased awareness of responsibility for the natural and social environment.

Description of the learning outcomes for the subject /module			
No. of learning outcome	Student, who has passed the (subject) knows /is able to /can:	SYMBOL (referring the standards)	Method of verification of learning outcomes*
W01	Explain and discuss basic biological function of epigenetic mechanisms of gene expression regulation;	K_B.W14., K_B.W18.	K
W02	Explain and discuss the applications of the epigenetic research in clinical practice;	K_B.W25., K_C.W38., K_C.W41., K_C.W42.	K
W03	Explain and discuss the impact of environmental factors on the epigenome;	K_B.W18., K_B.W23., K_B.W25., K_C.W33., K_C.W50.	K
W04	Characterize the technologies and data analysis methods used in epigenetic research;	K_B.W26., K_B.W27.	K

Table presenting LEARNING OUTCOMES in relation to the form of classes		
	Learning outcomes	Type of training

No. of learning outcome		Lecture	Seminar	Practical	Clinical classes	Simulations	E-learning	Other...
W01	K_B.W14., K_B.W18.	X						
W02	K_B.W25., K_C.W38., K_C.W41., K_C.W42.	X						
W03	K_B.W18., K_B.W23., K_B.W25., K_C.W33.,	X						
W04	K_B.W26., K_B.W27.	X						

Table presenting TEACHING PROGRAMME			
No. of a teaching programme	Teaching programme	No. of hours	References to learning outcomes
<b>Winter semester</b>			
<b>Lectures 15h</b>			
TK01	Epigenetics in a Healthy and Diseased Cell (Epimutations)	2	K_B.W14., K_B.W18., K_C.W33.
TK02	Epigenetic Biomarkers in Diagnosis - Part 1	2	K_B.W25., K_C.W33.
TK03	Epigenetic Biomarkers in Diagnosis - Part 2	2	K_B.W25., K_C.W33.
TK04	Nutrieptigenetics and Environmental Epigenetics	2	K_B.W25., K_C.W33., K_C.W50.
TK05	Pharmacoeptigenetics: Epigenetic Drugs and Personalized Medicine	2	K_C.W38., K_C.W41., K_C.W42.
TK06	Longevity - Epigenetics of Healthy Aging	2	K_B.W18., K_B.W23., K_B.W25.
TK07	Methods for Analyzing Epigenetic Changes	2	K_B.W26., K_B.W27.
TK08	Test	1	

Booklist
Obligatory literature:
1. How Science Works; Molecular Medicine; Carsten Carlberg, Eunike Velleuer, Ferdinand Molnár; Springer
Supplementary literature:
1. Taryma-Leśniak, Olga et al. "Current status of development of methylation biomarkers for in vitro diagnostic IVD applications." <i>Clinical epigenetics</i> vol. 12,1 100. 6 Jul. 2020, doi:10.1186/s13148-020-00886-6
2. Taryma-Lesniak, Olga et al. "Short history of 5-methylcytosine: from discovery to clinical applications." <i>Journal of clinical pathology</i> vol. 74,11 (2021): 692-696. doi:10.1136/jclinpath-2020-206922
3. Łuczowska, Karolina, Sokolowska Katarzyna Ewa et al. "Bortezomib induces methylation changes in neuroblastoma cells that appear to play a significant role in resistance development to this compound." <i>Scientific reports</i> vol. 11,1 9846. 10 May. 2021, doi:10.1038/s41598-021-89128-0

4. Łuczowska, Karolina et al. "Long-Term Treatment with Bortezomib Induces Specific Methylation Changes in Differentiated Neuronal Cells." <i>Cancers</i> vol. 14,14 3402. 13 Jul. 2022, doi:10.3390/cancers14143402
5. Bińkowski, Jan et al. "Epigenetic activation of antiviral sensors and effectors of interferon response pathways during SARS-CoV-2 infection." <i>Biomedicine &amp; pharmacotherapy = Biomedecine &amp; pharmacotherapie</i> vol. 153 (2022): 113396. doi:10.1016/j.biopha.2022.113396
6. Sokolowska, Katarzyna Ewa et al. "Identified in blood diet-related methylation changes stratify liver biopsies of NAFLD patients according to fibrosis grade." <i>Clinical epigenetics</i> vol. 14,1 157. 30 Nov. 2022, doi:10.1186/s13148-022-01377-6
7. Wojdacz, Tomasz K et al. "Limitations and advantages of MS-HRM and bisulfite sequencing for single locus methylation studies." <i>Expert review of molecular diagnostics</i> vol. 10,5 (2010): 575-80. doi:10.1586/erm.10.46
8. Wojdacz, Tomasz K, and Alexander Dobrovic. "Methylation-sensitive high resolution melting (MS-HRM): a new approach for sensitive and high-throughput assessment of methylation." <i>Nucleic acids research</i> vol. 35,6 (2007): e41. doi:10.1093/nar/gkm013

Student's workload	
Form of student's activity (in-class participation; activeness, produce a report, etc.)	Student's workload [h]
	Tutor
Contact hours with the tutor	15
Time spent on preparation to seminars/ practical classes	-
Time spent on reading recommended literature	10
Time spent on writing report/making project	-
Time spent on preparing to colloquium/ entry test	5
Time spent on preparing to exam	-
Student's workload in total	30
<b>ECTS credits for the subject (in total)</b>	<b>1</b>
<b>Remarks</b>	

\* Selected examples of methods of assessment:

EP – written examination

EU – oral examination

ET – test examination

EPR – practical examination

K – colloquim

R – report

S – practical skills assessment

RZC – practical classes report, incl. discussion on results

O – student's active participation and attitude assessment

SL – lab report

SP – case study

PS - assessment of student's ability to work independently

W – entry test

PM – multimedia presentation

other...